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Trends in Oral Cancer by Subsite in New Zealand

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A significant increase in incidence rates for all subsites of oral cancer in men and all but cancer of the salivary glands in women has occurred in New Zealand over the past 35 years. However, only male mortality rates of cancers of the nasopharynx and pharynx (excluding the nasopharynx) have significantly increased during this time period. Significant birth-cohort effects existed in the trends in incidence and mortality for cancers of the tongue, mouth, pharynx (excluding the nasopharynx), and nasopharynx among men. For cancers of the mouth and pharynx (excluding the nasopharynx) an increased risk for men born 1912–1932 existed, while an increased risk of cancer of the tongue occurred for men born 1922 onwards. For nasopharyngeal cancer, men born around 1912 and those born from about 1932 onwards were found to have an increased risk. For women, no consistent trends by birth-cohort were found for any oral subsite of cancer.

Keywords: oral cancer, birth-cohorts, incidence, mortality

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INTRODUCTION

ORAL CANCER is a term used to describe cancers of the lip, tongue, salivary glands, mouth and all parts of the pharynx. Oral cancer is a very common site of cancer throughout the world [1]. In several parts of the world, particularly eastern and central Europe, the incidence and mortality of oral cancer among men is increasing [2, 3]. Pronounced increases in oral cancer mortality among young and middle-aged European men have occurred [4]. Different generations of men have been shown to have different risks of oral cancer [5–7]. These birth-cohort variations in the risk of oral cancer in men have not been as pronounced among women in most countries [8].

In most countries these trends reflect cohort trends in mouth, tongue, or pharyngeal cancer. In Japan, mortality from mouth cancer has increased much greater than for all oral cancer sites combined while the risk of tongue cancer has increased only slightly for men born since 1920 [2]. An increase of cancer of the lip has been reported in Connecticut [9] while increased incidence of cancer of the salivary gland among men but not women has been reported in another part of the United States [10].

New Zealand has one of the oldest cancer registries in the world providing an opportunity to assess the trends in both incidence and mortality of the different subsites of oral cancer over the past 35 years [11].

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METHODS

The annual numbers of registrations for the 1954–1991 time period and deaths for the 1955–1991 time period for cancers of the lip, tongue, salivary glands, mouth, nasopharynx and pharynx, and estimates of the total New Zealand population for each 5-year age group for each sex were obtained from publications of the Ministry of Health. Since the Maori population represent only 7% of the New Zealand population aged 30 years or more and the risk of oral cancer among Maori is not particularly different from non-Maori [3], trends in the total population were examined. Registrations of cancer of the pharynx without further specification of the site of origin were included as cancers of the pharynx (excluding the nasopharynx) which were analysed separately from cancers of the nasopharynx. Allowance was made for changes in classification at the 3-digit level due to the successive revisions of the International Classification of Diseases [12]. Up to 1958 skin cancers were also recorded by the New Zealand Cancer Registry and the distinction between lip and skin cancer around the mouth was not always clear at registration. Consequently, registrations of lip cancer sharply declined in 1959. Therefore, trends in the incidence of lip cancer and all oral cancers combined from 1962 onwards have been assessed.

Age-specific incidence and mortality rates for 5-year age groups were calculated for 5-year time periods. Trends in age-specific rates for those less than age 75 years were assessed [13]. Age-standardised rates were calculated using the world standard population and trends in age-adjusted rates analysed [14]. To avoid any undue influence of the first time period, changes in age-standardised rates were expressed as an annual percentage change compared to the average rate over the time period examined.

Using 10-year age groups and four 10-year time periods with the first time period truncated to 1954–1961 for incidence

and 1955–1961 for mortality, birth-cohort analyses of trends were performed [15]. The 10-year aggregations were necessary to provide sufficient numbers of deaths and registrations in each age group and time period for the birth-cohort analyses of subsites.

RESULTS

Each year about 190 men and 100 women develop oral cancer in New Zealand and about 80 men and 35 women die from it. Mortality rates of oral cancer among men increased from the early 1960s while little change in mortality over time was observed among women (Fig. 1). Incidence rates have increased for both men and women. The overall male to female ratios for the 1987–1991 time period were 3.1 for mortality (95% C.I. 2.5–3.9) and 2.6 for incidence (95% C.I. 2.3–2.9).

All types of oral cancer were more common among men than women, particularly cancers of the lip, nasopharynx and pharynx (Table 1). While the commonest occurring types of oral cancers were cancers of the lip, mouth and pharynx, those of the tongue, mouth and pharynx contributed most to mortality.

Over the time period examined, trends in the incidence of the different types of oral cancer have varied. Among men, significant increases in the incidence of cancer of the lip, tongue, salivary glands, mouth, nasopharynx and pharynx were apparent. However, significant increases in male mortality were only observed for cancers of the nasopharynx and pharynx. An increase in male mortality for cancers of the salivary glands was suggested.

Among women, significant increases in the incidence of cancer of the lip, tongue, mouth, pharynx and nasopharynx were observed. A decrease in the female incidence of cancer of the salivary glands was suggested. However, no significant changes in female mortality for any of these subsites of oral cancer were found. The increased incidence of cancers of the mouth, pharynx (excluding the nasopharynx) and nasopharynx in men was mainly due to an increase among those aged 45–64 years.

Successive generations of men born late last century had decreasing risks of cancer of the mouth but men born 1912–1932 experienced an increased occurrence of cancers of the mouth (Fig. 2) and pharynx (excluding nasopharynx) (Fig. 3). An increased incidence of cancer of the tongue was confined to men born 1922 onwards (Fig. 4). For cancer of the nasopharynx, incidence was increased among men born around 1912 and again subsequently for those born from about 1932 onwards (Fig. 5). Similar birth-cohort effects for these generations of men were observed (not shown) for mortality of cancer of the mouth, tongue, pharynx (excluding the nasopharynx) and nasopharynx.

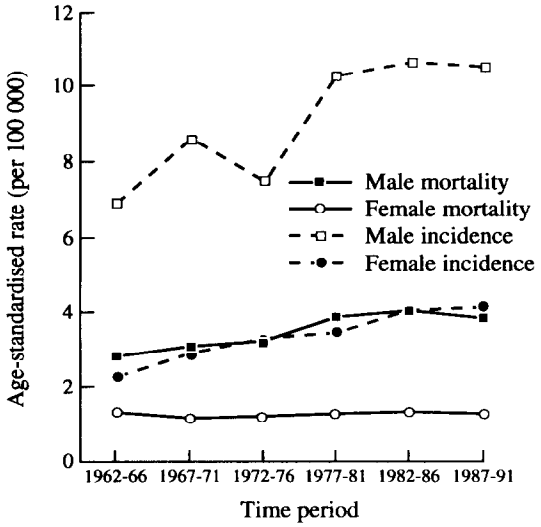

Fig. 1. Trends in the male and female age-standardised incidence and mortality rates (per 100 000) of oral cancer in 5-year time periods.

There was some evidence of an increased incidence of cancer of the tongue among women born from about 1922 onwards but no obvious birth-cohort effect for female mortality was observed (not shown). Conversely, an increased mortality of cancer of the pharynx (excluding the nasopharynx) was present for women born about 1922 but no similar increase in incidence for these women was present (not shown). Too few cancers of the nasopharynx occurred in women to be confident of any changes in risk for different birth-cohorts of women. No male or female birth-cohort trends in incidence or mortality were observed for cancer of the lip.

DISCUSSION

The increase in the incidence of oral cancer among men in New Zealand has occurred for all sites but has been proportionally greatest for cancers of the pharynx and nasopharynx. Mortality has also increased significantly for these two sites. While the incidence of oral cancer among women increased for all sites except the salivary glands, no significant increase in female mortality for any oral cancer site was observed over the 35 years studied.

The relatively modest increase in the age-standardised rates of cancers of the mouth and tongue among men obscured the changing pattern of risk between generations or birth-cohorts. Birth-cohort trends in oral cancer among men have been observed in other countries [5–7]. In New Zealand these trends have been different for different subsites of oral cancer. Generations of New Zealand men born from about 1912 to 1932 have experienced an increased risk of cancer of the mouth and pharynx (excluding the nasopharynx) while only those born around 1922 onwards experienced an increased risk of cancer of the tongue compared to earlier generations. Nasopharyngeal cancer in men appeared to be increasing among generations born from about 1932 onwards.

Over 90% of all cases of oral cancer have been treated in public hospitals [16] and the gradual increase over time in registrations from private hospitals cannot account for the trends in incidence observed. Over the last decade immigration to New Zealand has increased from Pacific island populations (less than 10% of the total population) and more recently for populations from South-east Asia (less than 3% of the total population). The countries of origin of some of these migrants are known for their high incidence of oral cancer, in particular nasopharyngeal cancer, and, while these migration patterns may have had a small influence on the incidence rates for the most recent 5-year time period (1987–1991), they are unlikely to have contributed to the trends observed for the overall time period.

The consumption of alcoholic beverages and cigarette smoking are major synergistic risk factors for cancers of the mouth, tongue and pharynx [17–19]. Differences in the

Table 1. Numbers of deaths and registrations over the time period and age-standardised mortality and incidence rates per 100 000 for the 1987–1991 time period and average annual percentage change in rate for cancers of the lip, salivary glands, tongue, mouth, nasopharynx and pharynx in New Zealand

Site (ICD-9)	Time period	Sex	Mortality			Incidence		
			Numbers of deaths	Rate (1987–1991)	Average annual change	Numbers of registrations	Rate (1987–1991)	Average annual change
Lip	1962–1991	M	115	0.09	−4.5%	1423	3.3	2.5%*
(140)		F	26	0.05	0.6%	338	0.9	8.1%*
Tongue	1957–1991	M	427	0.79	0.4%	706	1.3	1.0%*
(141)		F	237	0.38	−0.7%	416	0.7	1.9%*
Salivary	1957–1991	M	220	0.46	1.8%	565	1.3	1.6%*
glands (142)		F	131	0.17	−2.2%	447	0.7	−1.3%
Mouth	1957–1991	M	393	0.77	0.6%	808	1.8	1.4%*
(143–145)		F	254	0.39	0.9%	516	1.0	3.2%*
Nasopharynx	1957–1991	M	171	0.54	4.8%*	255	0.8	4.3%*
(147)		F	47	0.10	2.7%	90	0.3	6.4%*
Pharynx	1957–1991	M	581	1.32	2.5%*	897	2.2	3.8%*
(146, 148, 149)		F	193	0.27	−1.1%	329	0.7	1.1%*

*$P < 0.05$, chi-square test for trend.

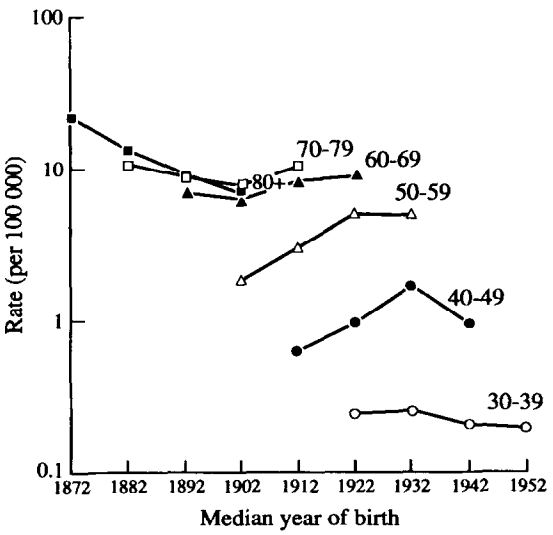

Fig. 2. Male age-specific incidence rates of mouth cancer by birth-cohorts identified by median year of birth.

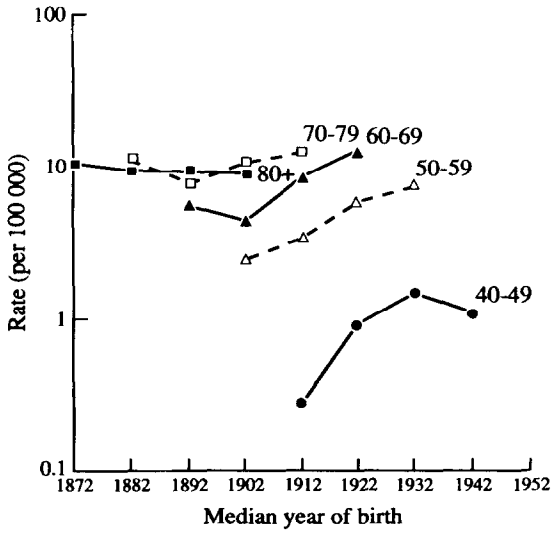

Fig. 3. Male age-specific incidence rates of pharyngeal cancer, other than cancer of the nasopharynx, by birth-cohorts identified by median year of birth.

consumption of alcoholic beverages and cigarette smoking among different generations are the most likely explanation of the trends in incidence and mortality of cancers of the mouth and pharynx among men in New Zealand. Men born around 1912–1922 were young adults during the Second World War and these generations had an increased prevalence of cigarette smoking.

Average per capita consumption of alcohol increased until about 1978 but has been decreasing over the past decade. The major alcoholic beverage consumed by men in New Zealand has been beer but the consumption of wine has been increasing [20]. Unfortunately, information about the pattern of alcohol consumption for different generations of New Zealanders and how this may have changed with age was unavailable. The habit of chewing tobacco has not been very common in New Zealand but the prevalence of the habit in New Zealand has not been extensively studied.

Other risk factors for cancers of the mouth and tongue, such as nutritional deficiencies, poor dentition or poor oral hygiene [21, 22] are less likely to explain the increased risk in New Zealand compared to other countries. Oral health has been improving considerably in New Zealand [23].

Recently, different types of human papillomavirus have been found in some cancers of the tongue [24, 25] and nasopharynx [26]. Some of these types of human papillomavirus are known to cause cancer of the cervix. Sexual transmission of these viruses to the oral cavity through oral sex has not been found to be strongly associated with oral cancer [27]. However, few studies have assessed this and the possibility of a causal role of human papillomaviruses in the development of some types of oral cancer requires further epidemiological investigation. Diets rich in fresh fruits and vegetables appear to be protective towards oral cancer [28] and

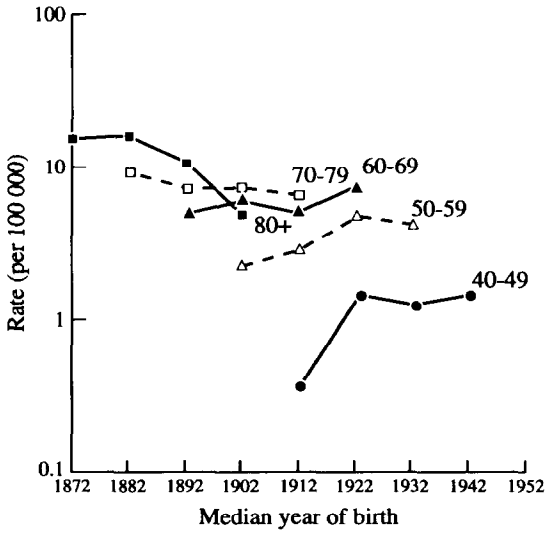

Fig. 4. Male age-specific incidence rates of tongue cancer by birth-cohorts identified by median year of birth.

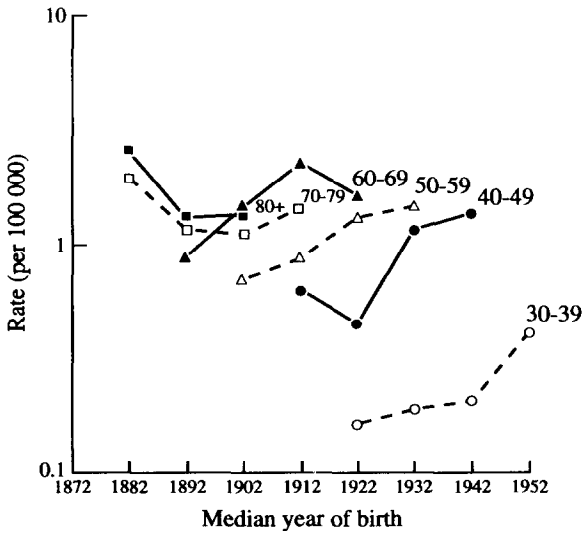

Fig. 5. Male age-specific incidence rates of nasopharyngeal cancer by birth-cohorts identified by median year of birth.

could possibly influence the risk of human papillomavirus colonisation of, or persistence in, the oral cavity.

Over the 1962–1991 time period the incidence of cancer of the lip increased considerably, particularly among women, while mortality was unchanged among women and declined among men. It is not clear whether this increased incidence of lip cancer was due to improved cancer registration or changes in the coding of skin and lip cancer over time. Marked differences in trends in lip cancer incidence and mortality between countries such as New Zealand, Australia, the United Kingdom, Canada and the United States appear to exist [3]. Chronic herpes simplex infection has inconsistently been associated with cancer of lip [27, 29, 30] but little information about the prevalence of this very common affliction is available.

Though cancer of the salivary glands is relatively rare, there was some evidence of an increased risk for men while the incidence among women was declining. A similar trend among men has been reported in the United States [10]. Such contrasting trends between the sexes are unlikely to have been due to changes in the coding of cancer of the minor salivary glands between the 7th and 9th revisions of the International Classification of Diseases. Ionising radiation is the only factor known to cause cancer of the salivary glands [31]. Past exposure to dental and other radiography of the head and neck has been found to be associated with cancer of the salivary glands [32] but the much lower exposure to ionising radiation of modern radiographic equipment can be expected to have significantly lowered this risk.

The incidence of cancer of the nasopharynx increased among men and women in New Zealand. The increased incidence of nasopharyngeal cancer for men born around 1912 was probably due to increased cigarette consumption among this generation. However, the increased incidence among recent generations of men has occurred while the prevalence of cigarette smoking for successive generations has been declining. An increased risk of nasopharyngeal cancer has been described for forestry workers in New Zealand but it is difficult to clearly attribute why such an association should exist [33]. Some, but not all, of the increased incidence of nasopharyngeal cancer may be due to recent migration to New Zealand of people from countries with high incidence rates. Also, historically there have been more Chinese migrants to New Zealand from southern China where the incidence of nasopharyngeal cancer is very high. The increased incidence of nasopharyngeal cancer in New Zealand requires further investigation.

Unlike some countries [34], New Zealand does not have a clear target for reducing the consumption of alcoholic beverages. Recognition that the consumption of alcoholic beverages causes cancer has been poor in New Zealand. Public health policy regarding alcoholic beverages is currently being developed [20]. It is hoped that this, along with greater recognition of oral cancer at an earlier stage of the disease and possibly the treatment of associated pre-malignant conditions of the oral cavity, may help reduce the burden of oral cancer in New Zealand.

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